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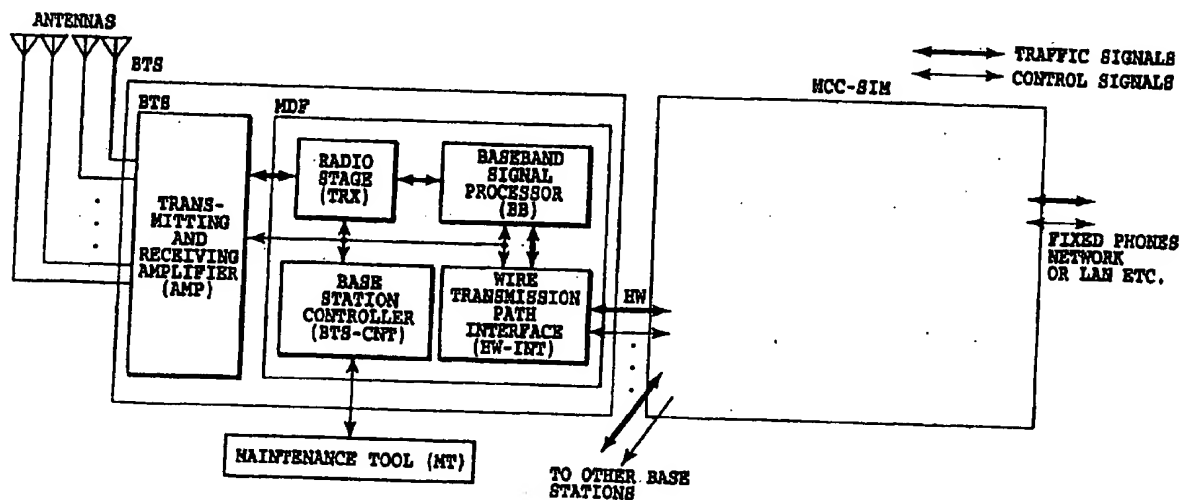
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(54) Titre : STATION DE BASE DE SYSTEME DE COMMUNICATIONS MOBILES  
(54) Title: BASE STATION APPARATUS OF MOBILE COMMUNICATION SYSTEM



(57) Abrégé/Abstract:

A base station including a transmitting and receiving amplifier for amplifying CDMA signals exchanged with a mobile station; a radio stage connected to the transmitting and receiving amplifier for carrying out D/A conversion of a transmitted signal that undergoes baseband spreading, followed by quadrature modulation, and for carrying out quasi-coherent detection of a received signal, followed by A/D conversion; a baseband signal processor connected with the radio stage for carrying out baseband signal processing of the transmitted signal and the received signal; a transmission interface connected with the baseband signal processor for implementing interface with external channels; and a base station controller for carrying out control such as management of radio channels and establishment and release of the radio channels. The base station communicates with the external channels using ATM cells, and with the mobile stations using the CDMA signals by mapping a plurality of logical channels into a plurality of physical channels. The CDMA signals are spreading using two types of spreading code sequences, that is, a short code and a long code.

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## ABSTRACT OF THE DISCLOSURE

A base station including a transmitting and receiving amplifier for amplifying CDMA signals exchanged with a mobile station; a radio stage connected to the transmitting and receiving amplifier for carrying out D/A conversion of a transmitted signal that undergoes baseband spreading, followed by quadrature modulation, and for carrying out quasi-coherent detection of a received signal, followed by A/D conversion; a baseband signal processor connected with the radio stage for carrying out baseband signal processing of the transmitted signal and the received signal; a transmission interface connected with the baseband signal processor for implementing interface with external channels; and a base station controller for carrying out control such as management of radio channels and establishment and release of the radio channels. The base station communicates with the external channels using ATM cells, and with the mobile stations using the CDMA signals by mapping a plurality of logical channels into a plurality of physical channels. The CDMA signals are spreading using two types of spreading code sequences, that is, a short code and a long code.

## SPECIFICATION

### BASE STATION APPARATUS OF MOBILE COMMUNICATION SYSTEM

5

#### TECHNICAL FIELD

The present invention relates to a base station  
in a mobile communications system, and more  
particularly to a base station capable of carrying  
10 out communications with mobile stations through high  
speed digital communication channels using CDMA.

#### BACKGROUND ART

15 Recently, base stations in mobile communication  
systems have become increasingly faster owing to the  
development of novel communications methods such as  
CDMA (code division multiple access), which become  
possible with recent advances in digital  
communications techniques. In addition, fixed  
20 stations are also digitized, and come to use new  
switching networks such as ATM networks.

Thus, new base stations are required which meet  
such advances in technology.

#### 25 DISCLOSURE OF THE INVENTION

An object of the present invention is to provide

a novel, high speed, digital base station best suited to achieving communications with mobile stations by CDMA, and with a control office by ATM.

5 In the first aspect of the present invention, there is provided a digital radio communication system comprising:

transmitting one or more known pilot symbols at every fixed interval; and

10 receiving, on a receiving side, the pilot symbols, and carrying out coherent detection using the received pilot symbols,

wherein a number of the pilot symbols that are transmitted periodically is variable in accordance with a transmission rate.

15 According to the configuration above, a trade-off can be optimized between degradation in accuracy of coherent detection due to a reduction of the number of the pilot symbols and an increase in overhead due to the increase of the number of pilot symbols.

20 In the second aspect of the present invention, there is provided a digital radio communication system comprising:

transmitting, on a transmitting side, one or more known pilot symbols at every fixed slot interval;

25 assembling a frame from a plurality of the slots; and

receiving, on a receiving side, the pilot symbols, and carrying out coherent detection using the received pilot symbols,

5 wherein the pilot symbols consist of a known pilot symbol portion and a sync word portion for frame alignment.

Here, the pilot symbol portion and the sync word portion may be transmitted alternately at fixed intervals in the pilot symbols.

10 The receiving side may carry out the coherent detection using the known pilot symbol portion, and may employ, after establishing the frame alignment using the sync word portion, the sync word portion for the coherent detection.

15 Using sync word as a part of the pilot symbols makes possible to prevent an increase in overhead of the coherent detection.

In the third aspect of the present invention, there is provided a mobile communication system  
20 using a digital radio communication scheme, wherein mapping, which maps into one physical channel a plurality of logical channels for transmitting information to be broadcasted by a base station, is varied in accordance with a changing rate of data to  
25 be transmitted over each of the logical channel.

Here, the mapping may be carried out by varying

an occurrence rate of the logical channels.

The mapping may fix a position of at least one logical channel.

5 The information to be broadcasted over the logical channels may be information on a reverse direction interfering power amount.

The information to be broadcasted over the logical channels may be control channel information on a contiguous cell or on a current cell.

10 Such an arrangement enables transmission to be implemented in accordance with characteristics of broadcasted information, thereby implementing efficient transmission.

15 In the fourth aspect of the present invention, there is provided a mobile communication system using a digital radio communication scheme, wherein a number of radio frames of a fixed duration on a physical channel is varied in accordance with a transmission rate, the radio frames constituting a processing unit on a logical channel.

20 Such an arrangement makes it possible to optimize the unit to which the error detecting code (CRC) is provided, reducing the overhead of processings.

25 In the fifth aspect of the present invention, there is provided a mobile communication system using CDMA, the mobile communication system uses for

an inphase component and a quadrature component a same short code and different long codes as spreading codes.

Here, the different long codes may have their  
5 phases shifted.

This configuration prevents short codes which are finite resources from being wasted.

In the sixth aspect of the present invention, there is provided a mobile communication system  
10 employing a digital radio communication scheme, wherein frame transmission timings on physical channels from a base station to mobile stations are delayed by random durations for respective sectors associated with the same base station.

Here, the random durations may be assigned to  
15 respective dedicated physical channels at a call setup.

Providing the random delay in this way makes it possible for the interfering power to be uniformly  
20 distributed along the time axis when there are multiple physical channels which are transmitted intermittently, thereby reducing collision of signals.

In the seventh aspect of the present invention, there is provided a multicode transmission system in  
25 a CDMA mobile communication system, which



communicates with a mobile station over a plurality of physical channels that use different spreading codes, the multicode transmission system comprising:

5 transmitting one or more pilot symbols and a transmission power control command through one of the plurality of physical channels; and

10 carrying out in common with the plurality of physical channels coherent detection using the same pilot symbols and transmission power control in accordance with the same transmission power control command.

15 Here, transmission power of a portion of the pilot symbols and the transmission power control command transmitted over the one of the plurality of physical channels may be greater than transmission power of other data portions.

20 Transmission power of the portion of the pilot symbols and the transmission power control command transmitted over the one of the plurality of physical channels may be greater than transmission power of other data portions by a factor of a number of the multICODES.

25 In the eighth aspect of the present invention, there is provided a multicode transmission system in a CDMA mobile communication system, which communicates with a mobile station over a plurality

of physical channels that use different spreading codes, the multicode transmission system comprising:

assigning to the plurality of physical channels same one or more pilot symbols and a same

5 transmission power control command;

transmitting a portion of the pilot symbols and the transmission power control command on the plurality of physical channels by spreading only that portion using a same spreading code; and

10 carrying out in common with the plurality of physical channels coherent detection using the same pilot symbols and transmission power control in accordance with the same transmission power control command.

15 This makes it possible to implement efficient multicode transmission.

In the ninth aspect of the present invention, there is provided a transmission power control system in a CDMA mobile communication system, wherein

20 a base station carries out transmission power control in accordance with a predetermined pattern until synchronization in the base station is established, receives, when the synchronization is established, a transmission power control command

25 based on SIR measurement results in a mobile

station, carries out transmission power control in response to the transmission power control command, and transmits a transmission power control command based on SIR measurement results in the base station; and

the mobile station carries out transmission power control from an initial value, and transmits, after the synchronization has been established, the transmission power control command based on the SIR measurement results in the mobile station.

Here, the predetermined pattern may be a pattern for rapidly increasing transmission power up to a predetermined value, and subsequently gradually increasing the transmission power.

The predetermined pattern may be variable in the base station.

The initial value in the mobile station may be transmitted from the base station.

The base station may transmit, before the synchronization in the base station is established, to the mobile station a transmission power control command of a predetermined second pattern; and

the mobile station may control transmission power in response to the transmission power control command which is transmitted.

The transmission power control command of the

second pattern may be varied by the base station.

The mobile station may carry out, until the synchronization in the base station is established, the transmission power control in accordance with a pattern predetermined in the mobile station.

Thus gradually increasing forward transmission power can prevent communications with other mobile stations from being adversely affected. Furthermore, since the control is carried out in two stages, the synchronization can be established quickly. Since the base station takes the initiative of the power control, optimum control patterns can be selected. In addition, using the fixed control pattern in the mobile station simplifies the configuration.

In the tenth aspect of the present invention, there is provided a mobile communication system employing a packet digital radio communication scheme between a base station and mobile stations, wherein the base station

makes a decision as to whether to switch physical radio channels to be used; and

switches, if necessary, the physical radio channels to be used, and wherein the foregoing control is carried out between the base station and the mobile stations without involving connection

control of the base station with a wire section.

Here, the switching may be carried out in accordance with traffic volume between the base station and the mobile stations.

5       The physical radio channels may be a common physical radio channel and a plurality of dedicated physical radio channels.

      Since the switching control in accordance with the present invention carries out the switching  
10       control based on the decision of the base station (BTS) in this way, it does not involve the switching control in the wire section (between the base station and control center (BSC), for example). This makes it possible to reduce the load of the  
15       switching control, and to implement high speed switching control.

#### BRIEF DESCRIPTION OF THE DRAWINGS

      Fig. 1 is a block diagram showing a functional  
20       configuration of a base station in accordance with the present invention;

      Fig. 2 is a diagram illustrating a structure of a logical channel;

      Fig. 3 is a diagram illustrating a structure of a  
25       physical channel;

      Fig. 4 is a diagram showing the relationship of